

Table 8. Power-Density Spectrum Measurement Bandwidths

| Channel Separation (kHz) | Measurement Span (kHz) 501<N<1001 | Resolution Bandwidth (Hz) |
|-----------------------------|---|-------------------------------|
| 6.25 | (N-1) x 50 | 100 |
| 7.50 | (N-1) x 50 | 100 |
| 12.50 | (N-1) x 100 | 100 |
| 15.00 | (N-1) x 100 | 100 |
| 25.00 | (N-1) x 150 | 300 |
| 30.00 | (N-1) x 150 | 300 |

Note: N = number of points in analyzer span

Table 9. Noise Considerations

| Frequency Range | Environment | Action |
|-------------------------------|--------------|-----------------------|
| All | Fixed (site) | Consider Noise |
| < 400 MHz | Mobile | Consider Noise |
| near 821 MHz | Mobile | Consider Noise |
| ≥ 400 MHz but not near 821 | Mobile | Noise rarely an issue |

Table 10. Difference between Powers (dB)

| Difference | Add To | | Difference | Add To | | Difference | Add To |
|------------|--------|--|------------|--------|--|------------|--------|
| 0.00 | 3.010 | | 3.40 | 1.635 | | 8.00 | 0.639 |
| 0.20 | 2.911 | | 3.60 | 1.573 | | 8.50 | 0.574 |
| 0.40 | 2.815 | | 3.80 | 1.513 | | 9.00 | 0.515 |
| 0.60 | 2.721 | | 4.00 | 1.455 | | 9.50 | 0.461 |
| 0.80 | 2.629 | | 4.20 | 1.399 | | 10.00 | 0.414 |
| 1.00 | 2.539 | | 4.40 | 1.345 | | 11.00 | 0.331 |
| 1.20 | 2.451 | | 4.60 | 1.293 | | 12.00 | 0.266 |
| 1.40 | 2.366 | | 4.80 | 1.242 | | 13.00 | 0.216 |
| 1.60 | 2.284 | | 5.00 | 1.193 | | 14.00 | 0.170 |
| 1.80 | 2.203 | | 5.20 | 1.146 | | 15.00 | 0.135 |
| 2.00 | 2.124 | | 5.40 | 1.100 | | 16.00 | 0.108 |
| 2.20 | 2.048 | | 5.60 | 1.056 | | 17.00 | 0.086 |
| 2.40 | 1.974 | | 5.80 | 1.014 | | 18.00 | 0.068 |
| 2.60 | 1.902 | | 6.00 | 0.973 | | 19.00 | 0.054 |
| 2.80 | 1.832 | | 6.50 | 0.877 | | 20.00 | 0.043 |
| 3.00 | 1.764 | | 7.00 | 0.790 | | 25.00 | 0.016 |
| 3.20 | 1.698 | | 7.50 | 0.710 | | 30.00 | 0.004 |

Table 11. Re-Classification of USGS Land Use/ Land Cover Codes

| USGS Classification Number | USGS Classification Description | New Classification Number | New Classification Description |
|---|--|--|---------------------------------------|
| 11 | Residential | 7 | Residential |
| 12 | Commercial and services | 9 | Commercial/industrial |
| 13 | Industrial | 9 | Commercial/industrial |
| 14 | Transportation, communications, & utilities | 1 | Open land |
| 15 | Industrial and commercial complexes | 9 | Commercial/industrial |
| 16 | Mixed urban and built-up lands | 8 | Mixed urban/buildings |
| 17 | Other urban and built-up land | 8 | Mixed urban/buildings |
| 21 | Cropland and pasture | 2 | Agricultural |
| 22 | Orchards, groves, vineyards, nurseries, and horticultural | 2 | Agricultural |
| 23 | Confined feeding operations | 2 | Agricultural |
| 24 | Other agricultural land | 2 | Agricultural |
| 31 | Herbaceous rangeland | 3 | Rangeland |
| 32 | Shrub and brush rangeland | 3 | Rangeland |
| 33 | Mixed rangeland | 3 | Rangeland |
| 41 | Deciduous forest land | 5 | Forest land |
| 42 | Evergreen forest land | 5 | Forest land |
| 43 | Mixed forest land | 5 | Forest land |
| 51 | Streams and canals | 4 | Water |
| 52 | Lakes | 4 | Water |
| 53 | Reservoirs | 4 | Water |
| 54 | Bays and estuaries | 4 | Water |
| 61 | Forested wetland | 5 | Forest land |
| 62 | Non-forest wetland | 6 | Wetland |
| 71 | Dry salt flats | 1 | Open land |
| 72 | Beaches | 1 | Open land |
| 73 | Sandy areas other than beaches | 1 | Open land |
| 74 | Bare exposed rock | 1 | Open land |
| 75 | Strip mines, quarries, and gravel pits | 1 | Open land |
| 76 | Transitional areas | 1 | Open land |
| 77 | Mixed barren land | 1 | Open land |
| 81 | Shrub and brush tundra | 1 | Open land |
| 82 | Herbaceous tundra | 1 | Open land |
| 83 | Bare ground | 1 | Open land |
| 84 | Wet tundra | 1 | Open land |
| 85 | Mixed tundra | 1 | Open land |
| 91 | Perennial snowfields | 10 | Snow & ice |
| 92 | Glaciers | 10 | Snow & ice |

Table 12. Local Clutter Attenuation in dB as a Function of Frequency and Land Use Classification

| | Frequency (MHz) | | | | | | |
|---------------------------|------------------------|--------------|--------------|--------------|---------------|---------------|----------------------------|
| Classification | 50.0 | 100.0 | 200.0 | 500.0 | 1000.0 | 2000.0 | Reclassified Number |
| open land | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1 |
| agricultural | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2 |
| rangeland | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3 |
| water | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4 |
| forest land | 2.0 | 3.0 | 5.0 | 7.0 | 10.0 | 12.0 | 5 |
| wetland | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6 |
| residential | 3.0 | 5.0 | 7.0 | 10.0 | 12.0 | 15.0 | 7 |
| mixed urban/ buildings | 4.0 | 6.0 | 9.0 | 12.0 | 15.0 | 17.0 | 8 |
| commercial/ industrial | 4.0 | 6.0 | 9.0 | 12.0 | 15.0 | 17.0 | 9 |
| Snow & ice | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10 |

Warning: These attenuation values apply only when the Okumura/Hata/Davidson model is used in the 'Open' environment. Otherwise, attenuation may be included twice.

Table 13. Values for Standard Deviate Unit

| Percentage (%) | Z_{α} | $Z_{\alpha/2}$ |
|-----------------------|--------------------------------|----------------------------------|
| 50 | 0 | 0 |
| 70 | 0.52 | 1.04 |
| 80 | 0.84 | 1.28 |
| 85 | 1.04 | 1.51 |
| 90 | 1.28 | 1.65 |
| 95 | 1.65 | 1.96 |
| 97 | 1.88 | 2.17 |
| 99 | 2.33 | 2.58 |

Appendix-B. Recommended Data Elements for Automated Modeling, Simulation, and Spectrum Management of Wireless Communications Systems

Appendix-B. Recommended Data Elements for Automated Modeling, Simulation, and Spectrum Management of Wireless Communications Systems

The following information is required to facilitate Spectrum Management. Sufficient information is required to calculate the Effective Radiated Power (ERP_d) relative to a half wave dipole and the required signal levels for the minimum reliability for the Channel Performance Criterion (CPC) over the Protected Service Area. The existing systems must also be defined so that a bi-directional evaluation can be performed. The existing system(s) will be comprised of co-channel licensees, adjacent channel(s) and potentially alternate and second alternate channels for cases where a wide bandwidth channel is being utilized against narrow bandwidth channels.

Table B-1
Parameters of the Transmitter, [proposed]

| | | |
|-------|---|-------------------|
| 1.1 | Site Latitude dd, mm, ss N/S | |
| 1.1.1 | Site Longitude ddd, mm, ss W/E | |
| 1.2 | Power supplied to the antenna | dBm |
| 1.3 | Antenna model and manufacturer | |
| 1.3.1 | Maximum Antenna Gain | dBd |
| 1.3.2 | Azimuth of directional gain if applicable | ° from True North |
| 1.3.3 | Maximum Effective Radiated Power | dBm _d |
| 1.4 | Antenna Height Above Ground Level | (m) HAGL |
| 1.5 | Site Elevation, Height Above Mean Sea Level | (m) HAMSL |
| 1.6 | Tower Height | m |
| 1.7 | Modulation Type | Table 5 |
| 1.7.1 | Vocoder type | |
| 1.7.2 | Adjacent Channel Power SPD histogram | dBc/bin |
| 1.8 | Bandwidth | kHz |
| 1.9 | Frequency | MHz |

Antenna Pattern - Provide manufacturer and model number so that an antenna pattern can be obtained. Leaving 1.3.2 blank implies omnidirectional and eliminates the requirement for an antenna pattern.

Table B-2
Parameters of the Receiver [proposed]

| | | |
|-------|--|---------|
| 2.1 | Reference Static Sensitivity rel to 12 dBS or 5% BER | dBm |
| 2.2 | Receiver Equivalent Noise Bandwidth (ENBW)(Table 3) | kHz |
| 2.3 | Channel Performance Criterion, faded DAQ or % BER | Table 5 |
| 2.3.1 | Usage Losses (in car or in building loss) | dB |
| 2.4 | Antenna Gain (include pattern and polarization losses) | dBd |
| 2.4.1 | Cable Loss | dB |
| 2.5 | Antenna Height Above Ground Level (HAGL) | m |
| 2.6 | Minimum Reliability for CPC at Service Area boundary | % |
| 2.7 | Frequency | MHz |
| 2.8 | Service Area definition | |
| 2.9 | Voting or Diversity? V(voting), DX (x branches) | |
| 2.10 | Simplex operation of mobile units? Y/N | |

Service area definition is required to determine where the mobile radios operate. It can be defined by:

- A radius around the site or a specific latitude/longitude.
- A rectangle with the opposite corners defined by latitude/longitude.
- Political boundary such as city, county, state.
- A political boundary plus an additional distance of "X" miles.
- A set of latitude/longitudes ordered in a counter clockwise direction so that when the points are connected, the resulting irregular polygon defines the required service area.

Simplex operation impacts adjacent channel reuse distance because of mobile to mobile potential interference.

Table B-3
Parameters for the Transmitter [existing]

| | | |
|-------|---|--------------------------|
| 3.1 | Site Latitude dd, mm, ss N/S | |
| 3.1.1 | Site Longitude ddd, mm, ss W/E | |
| 3.2 | Power supplied to the antenna | dBm |
| 3.3 | Antenna model and manufacturer | |
| 3.3.1 | Maximum Antenna Gain | dBd |
| 3.3.2 | Azimuth of directional gain if applicable | ° from True North |
| 3.3.3 | Maximum Effective Radiated Power | dBm_e |
| 3.4 | Antenna Height Above Ground Level | (m) HAGL |
| 3.5 | Site Elevation, Height Above Mean Sea Level | (m) HAMSL |
| 3.6 | Tower Height | m |
| 3.7 | Modulation Type | Table 5 |
| 3.7.1 | Vocoder type | |
| 3.7.2 | SPD histogram | dBc/bin |
| 3.8 | Bandwidth | kHz |
| 3.9 | Frequency | MHz |

Antenna Pattern - Provide manufacturer and model number so that an antenna pattern can be obtained.

Table B-4
Parameters of the Receiver [existing]

| | | |
|-------|--|----------------|
| 4.1 | Reference Static Sensitivity rel to 12 dBs or 5% BER | dBm |
| 4.2 | Receiver Equivalent Noise Bandwidth (ENBW)(Table 6) | kHz |
| 4.3 | Criterion Channel Performance, faded DAQ or % BER | Table 5 |
| 4.3.1 | Usage Losses (in car or in building loss) | dB |
| 4.4 | Antenna Gain (include pattern and polarization losses) | dBd |
| 4.4.1 | Cable Loss | dB |
| 4.5 | Antenna Height Above Ground Level (HAGL) | m |

| | | |
|------|--|-----|
| 4.6 | Minimum Reliability for CPC at Service Area boundary | % |
| 4.7 | Frequency | MHz |
| 4.8 | Service Area Definition | |
| 4.9 | Voting or Diversity? V(voting), DX (x branches) | |
| 4.10 | Simplex operation of mobile units? Y/N | |

Service area definition is required to determine where the mobile radios operate. It can be defined by:

- A radius around the site or a specific latitude/longitude.
- A rectangle with the opposite corners defined by latitude/longitude.
- Political boundary such as city, county, state.
- A political boundary plus an additional distance of "X" miles.
- A set of latitude/longitudes ordered in a counter clockwise direction so that when the points are connected, the resulting irregular polygon defines the required service area.

If none of the above is available, use the method of Appendix-D. This applies to existing stations only.

Simplex operation impacts adjacent channel reuse distance because of mobile to mobile potential interference.

The evaluation will be made bi-directional, proposed to existing and existing to proposed, in the talk-out direction only, utilizing the worst case based on service area definitions.

Table B-5
Protected Service Area (PSA)

| | | |
|-----|---|---|
| 5.1 | Existing station protected availability (0 for unprotected) | % |
| 5.2 | Proposed station protected availability (0 for unprotected) | % |

The following field widths are recommended:

Table B-6
Field Widths

| Sections | | Input Data | Output Data |
|----------|-------|---|---|
| 1.1 | 3.1 | nn◇nn◇nn◇h (DMS) | ±nn.nnnn (decimal degrees, not DMS) |
| 1.1.1 | 3.1.1 | nnn◇nn◇nn◇h (DMS) | ±nnn.nnnn (decimal degrees, not DMS) |
| 1.2 | 3.2 | nn.n | nn.n |
| 1.3 | 3.3 | Mfr: 8 alpha char Model: 25 alpha char | Mfr: 8 alpha char Model: 25 alpha char |
| 1.3.1 | 3.3.1 | ±nn.n | ±nn.n |
| 1.3.2 | 3.3.2 | nnn | nnn |
| 1.3.3 | 3.3.3 | nn.n | nn.n |
| 1.4 | 3.4 | nnnn | nnnn |
| 1.5 | 3.5 | ±nnnnn | ±nnnnn |
| 1.6 | 3.6 | nnnn | nnnn |
| 1.7 | 3.7 | 26 alpha char | 26 alpha char |
| 1.7.1 | 3.7.1 | 15 alpha char | 15 alpha char |
| 1.7.2 | 3.7.2 | Up to 500 @ ±nn.n | Up to 500 @ ±nn.n |
| 1.8 | 3.8 | nn.nn | nn.nn |
| 1.9 | 3.9 | nnnn.nnnn | nnnn.nnnn |
| 2.1 | 4.1 | -nnn.n | -nnn.n |
| 2.2 | 4.2 | nn.nn | nn.nn |
| 2.3 | 4.3 | nn.n | nn.n |
| 2.4 | 4.4 | ±nn.n | ±nn.n |
| 2.4.1 | 4.4.1 | -nn.n | -nn.n |
| 2.5 | 4.5 | nnnn | nnnn |
| 2.6 | 4.6 | nn.n | nn.n |
| 2.7 | 4.7 | nnnn.nnnn | nnnn.nnnn |
| 2.8 | 4.8 | 110 alpha characters | See Note 1 |
| 2.9 | 4.9 | 2 alpha characters | 2 alpha characters |
| 2.10 | 4.10 | 1 alpha character | 1 alpha character |
| 5.1 | 5.2 | nn.n | nn.n |

LEGEND:

| | | |
|---|---|---|
| h | = | hemisphere (N/S/E/W) |
| n | = | a numeric character |
| - | = | a minus sign (inserted for clarity) |
| ± | = | a plus sign, a minus sign, or a blank (implying plus) |
| ◇ | = | a space (inserted for clarity) |
| . | = | a decimal point |

Note 1: If the Service Area definition is in terms of a political boundary or a distance from a political boundary, the output data will consist of numerous pairs of latitude/longitude points. If the latitudes and longitudes are expressed in accordance with the RIGHT column for 1.1/3.1 and 1.2/3.2, each point will require 8 characters for each latitude and 9 for each longitude, excluding space characters between them. Political boundaries on coastlines or rivers will have numerous (possibly thousands of) points.

Note 2: For clarity, spaces must be included between fields (◇).

Note 3: Determine sign of output latitude/longitude from hemisphere. N & E are positive; S & W are negative. In the United States of America, latitudes are always positive and longitudes are generally negative. Some of the Aleutian Islands are in the Eastern Hemisphere.

Appendix-C. Simplified Explanation of Spectrum Management Process

Appendix-C. Simplified Explanation of Spectrum Management Process

C.1 Pull site elevation (AMSL) and antenna HAGL

C.2 Calculate ERP_d [Xmtr P_0 - cable losses - filtering losses + directional antenna gain (dB_d)]
e.g., 50 dBm - 2 dB - 4 dB + 8 dB = **52 dBm** (158.5 watts)

C.3 Use methods defined in this document to calculate the field strength at all points on the edge of the Service Area. If the field strength at any point on the edge of the Service Area exceeds 37 dB μ in the 150 MHz band or 39 dB μ in the 450 MHz band, the ERP must be reduced before proceeding.

C.4 Calculate Receiver requirements for CPC from reference sensitivity, in dBm or μ V, Table 5.

C.4.1 Faded Performance Threshold = Ref Sensitivity - C_s/N + C_r/N (for CPC)

e.g., for C4FM (-116 dBm -7.6 dB + 16.5 dB (DAQ 3)) = -107.1 dBm

C.4.2 Calculate ATP Target by adjusting for antenna gain, cable losses, building penetration margins, etc.

e.g., mobile with 2 dBd antenna and 3 dB cable loss, ATP Target = -106.1 dBm

C.5 Calculate coverage reliability for site independent of interference, noise only.

C.5.1 Pull Radial(s) from terrain data base. At each point, calculate propagation loss (L_1) for Open §5.1.2

C.5.2 Pull Environmental Loss from LULC cross reference (L_2) Table 12

C.5.3 Sum $L_1 + L_2$ = Propagation Loss e.g., 136 + 10 (500 MHz residential) = 146 dB.

C.5.4 Calculate **Mean Signal Level** = ERP_d - Propagation Loss e.g., 52 dBm -146 dBm = **-94 dBm**.

C.5.5 **Margin** = Mean Signal Level - ATP Target e.g., (-94 -(-106.1))=12.1 dB

C.5.6 **Z** = **Margin**/ σ e.g., 12.1/5.6 = 2.1607

C.5.7 Calculate Noise-only Reliability. e.g., $Z=2.16 \Rightarrow$ **98.46%**.

C.5.8 Store and continue iterating until PSA calculations are complete.

C.6 Calculate spectrally-equivalent ERP in adjacent channel

Using the power spectral density of the (proposed or existing) transmitter and the IF response of the (existing or proposed) receiver, calculate the amount of power intercepted by the receiver relative to one Watt for each instance.. Follow the procedure of Section 6.6.

C.6.1 For a proposed transmitter, collect the power spectral density on a bin by bin basis. If not in decibel units, put it into decibel units.

C.6.2 For an existing transmitter, if the **information** required in (C.6.1) is available use it, if not:

C.6.2.1 If the emission is appropriate for using Tables C-3 through C-9 with the appropriate IF responses, do so.

C.6.2.2 If the emission designator is 11KOF3E or 16KOF3E, and Tables C-3 - C-9 are not appropriate, use Table C-1 or C-2 and linear interpolation to form a bin-by-bin power spectrum.

C.6.2.3 Otherwise, form a bin-by-bin power spectrum based upon the relevant FCC Rule Section.

C.6.3 For applicants who have not yet selected specific equipment, or at the frequency coordinator's discretion, the method of C.6.2.3 may be used for any C.6.1 or C.6.2 situation.

e.g., (C.6.2.2) Create the SPD table in dBc/Hz for bins 2,500 Hz wide. For a lower RBW, linearly interpolate between data point when values are expressed as numeric, not in decibels.

e.g., (C.6.2.3) For a FCC mask which requires 60 dB adjacent channel rejection, the power in the adjacent channel is 60 dBc (10^{-6} watts) relative to the carrier. If it is to be divided into (for example) 100 bins, the power per bin would be -80 dBc (10^{-8} watts) per bin. The RBW is the frequency span divided by the number of bins. If this was 25 kHz, the RBW would be 250 Hz for the 100 bin example.

C.6.3 Determine the receiver IF response using the same RBW and bin centers as the transmitter SPD table.

C.6.3.1 If the receiver IF response is known, calculate a receiver response table using the formulas from Appendix-A, Table 4 and the parameters from Table 3.

C.6.3.2 If the receiver is existing, its IF response may be unknown. If so, use the values in TIA-603 § 3.1.6, 3.1.7, 4.1.6, 4.1.7, 5.1.6, or 5.1.7, as appropriate to determine adjacent channel rejection and apply this value uniformly across the entire adjacent channel. Assume zero on-channel rejection.

C.6.4 If it is desired to allow for frequency stability degradation, follow the rest of this section, otherwise assume no frequency error.

C.6.4.1 Use a standard deviation (σ) of 0. 4 times the sum of the FCC required stability (in Hz) for the combination of the fixed and mobile units. At 450 MHz the 12.5 kHz channelization requires 4 ppm stability, thus σ is 0.4×1800 or 720 Hz.

C.6.4.2 Decide on a confidence factor (e.g., 95%) and find the corresponding Z value from Table 13. (e.g., $Z=1.65$)

C.6.4.3 Reduce the frequency separation between the adjacent channel separation by $\Delta f = Z\sigma\sqrt{2}$. At UHF this example would be $(1.65)(720)(1.414) = 1680$ Hz offset.

C.6.5 Sum the SPD file (dB) for the current bin with the corresponding receiver IF response (dB) bin and store in a file. These bins must have the same RBW and center frequencies. Convert the results of this addition to power. Sum the powers in all the bins and convert that sum back into a decibel value. Add $10 \log(\text{RBW})$ (dB) to this sum. The result is the intercepted power of the victim receivers IF, relative to a one watt emitter which can be considered as a co-channel emitter. Reduce the ERPd of the interferer by this value for the simulation prediction.

C.7 Evaluate co- and adjacent-channel impact

C.7.1 Determine which sites to evaluate.

C.7.1.1 Find all existing sites on the frequency under consideration and both adjacent channels within 297 km.

[297 km is the sum of the 113 km protection distance plus line-of-site for $k=1.33$ for a 2,000 m HAAT mountain].

C.7.1.2 After the distance sorting process in Step C.7.1.1 above, the initial decision on whether to consider an interfering station further can be done using an analysis along the inter-station radial between the desired station and the interfering station. First, distance to the desired station coverage area boundary using the propagation method in Section 5. At the intersection of the inter-station radial and the designed station coverage area boundary, the magnitude of the interfering station signal is calculated, again using the Section 5 model. If the calculated interfering signal level at this intersection point is below the environmental noise level, this station need not be considered further as an interferer. For co-channel stations, if the desired median signal level at this point is 15 dB higher than the median interfering signal level plus the $C/(I+N)$ allowance for CPC, then sufficient margin exists for adequate service and the interfering station need not be considered further as an interferer. For adjacent channel stations, if the desired median signal level at this point is 15 dB higher than the sum of the interfering median signal level plus the adjacent channel protection ratio minus the $C/(I+N)$ allowance for CPC, then sufficient margin exists for adequate service and the interfering station need not be considered further as an interferer.

C.7.2 If the ratio of the desired station to interfering signal levels fall below the above criteria, or if the interferer is within the desired station coverage area, the interfering station will be subjected to further analysis. Voice systems may be subjected to either of the methods of Section 5.9.1 or of Section 5.9.2. If the results of the two methods conflict, the Monte Carlo Simulation is considered to be the more accurate, provided that the number of samples run is at least 5000. Because of "re-try" considerations, it is not practical to use the Simplified Estimate method for Data Systems. Thus, the Monte Carlo method must be used for data systems.

C.7.3 Interference Calculations

Calculate the interference potential using the methods of Sections 5.9.1 or 5.9.2.

C.8 If current evaluation was for proposed TX to existing RX and the existing TX to proposed RX evaluation hasn't yet been done, do that now by looping to C.2

•

C.9 Next configuration to evaluate. Loop to C.1

C.10 Continue to develop short list. Then evaluate short list in greater detail to determine the best recommendation.

Table C-1
Emission 11K0F3

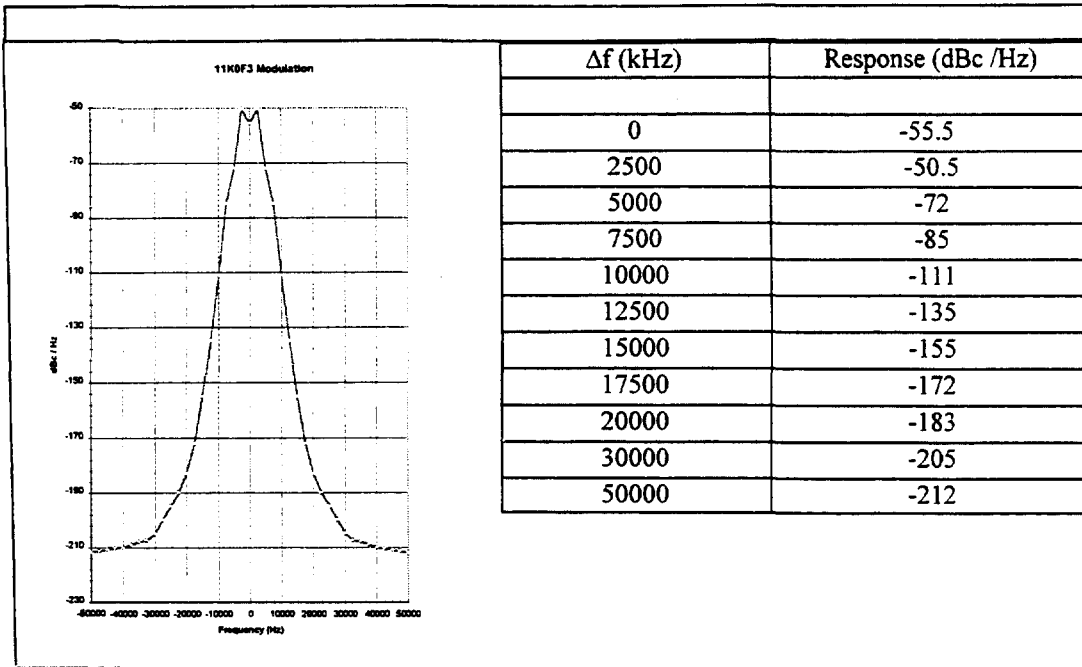
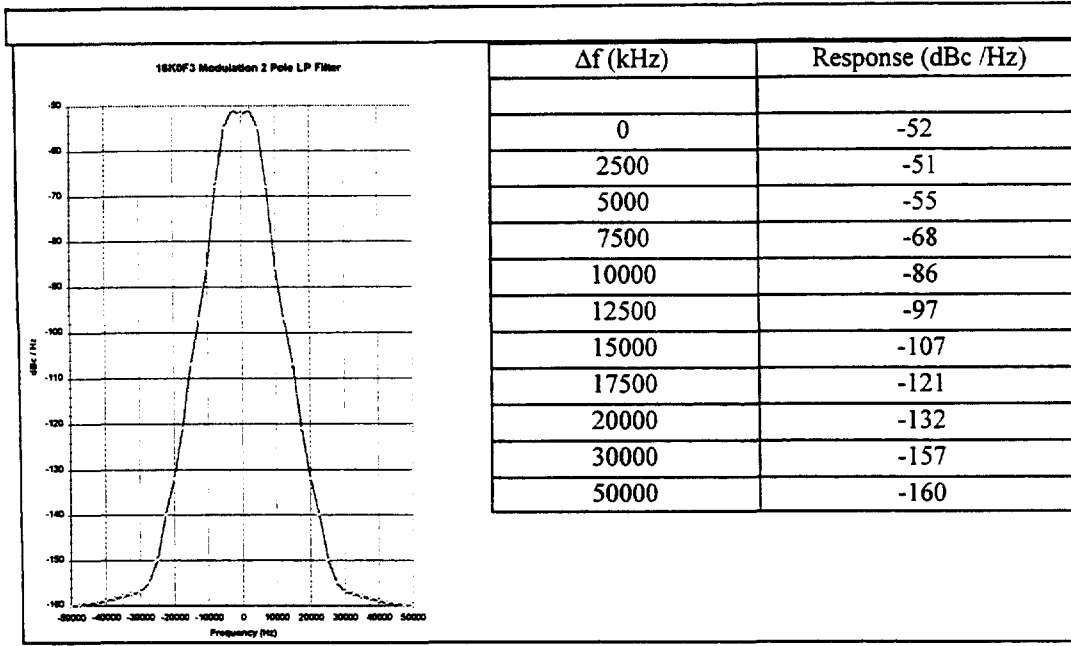


Table C-2
Emission 16K0F3



The values indicated represent the intercepted power for a one Watt emitter for a 1 Hz bin at the frequency offset from the carrier as indicated. The associated chart which is part of the table is provided as an aid for interpolation. For Tables C-3 through C-5, the LP filter indicated is per the FCC rules are respectively for: VHF (2 pole filter, 5 kHz deviation; UHF/800 (3 pole filter, 5 kHz deviation; and narrowband FM (5 pole filter, 2.5 kHz deviation. Tables C-3 through C-9 were calculated for a RBW < 50 Hz, creating a better prediction than can be obtained from Tables C-1 and C-2.

Table C-3. Intercepted Power (ACCP) from FM 2 Pole Filter 5 kHz Deviation Emitter

| | Intercepted Power from FM 2 Pole LP Filter 5 kHz Deviation | | | |
|------------------|--|--------|--------|----------|
| | VHF | | UHF | |
| IF Configuration | 30 kHz | 15 kHz | 25 kHz | 12.5 kHz |
| IF 12.6 kHz ENBW | -98.7 | -29.8 | na | na |
| IF 10.2 kHz ENBW | -100.0 | -40.1 | na | na |
| IF 7.8 kHz ENBW | -101.1 | -47.5 | na | na |
| IF 5.7 kHz ENBW | -102.4 | -52.6 | na | na |

Table C-4. Intercepted Power (ACCP) from FM 3 Pole LP Filter 5 kHz Deviation Emitter

| | Intercepted Power from FM 3 Pole LP Filter 5 kHz Deviation | | | |
|------------------|--|--------|--------|----------|
| | VHF | | UHF | |
| IF Configuration | 30 kHz | 15 kHz | 25 kHz | 12.5 kHz |
| IF 12.6 kHz ENBW | na | na | -92.5 | -16.5 |
| IF 10.2 kHz ENBW | na | na | -102.4 | -24.5 |
| IF 7.8 kHz ENBW | na | na | -110.7 | -33.9 |
| IF 5.7 kHz ENBW | na | na | -115.7 | -42.0 |

Table C-5. Intercepted Power (ACCP) from FM 5 Pole 2.5 kHz Deviation Emitter

| | Intercepted Power from FM 5 Pole LP Filter 2.5 kHz Deviation | | | |
|------------------|--|--------|--------|----------|
| | VHF | | UHF | |
| IF Configuration | 30 kHz | 15 kHz | 25 kHz | 12.5 kHz |
| IF 12.6 kHz ENBW | -138.3 | -51.5 | -119.5 | -32.3 |
| IF 10.2 kHz ENBW | -143.0 | -66.6 | -135.4 | -45.5 |
| IF 7.8 kHz ENBW | -144.2 | -80.0 | -139.1 | -58.5 |
| IF 5.7 kHz ENBW | -145.5 | -91.0 | -141.6 | -68.9 |

Table C-6. Intercepted Power (ACCP) from C4FM Emitter

| | Intercepted Power from C4FM | | | |
|------------------|-----------------------------|--------|--------|----------|
| | VHF | | UHF | |
| IF Configuration | 30 kHz | 15 kHz | 25 kHz | 12.5 kHz |
| IF 12.6 kHz ENBW | -83.9 | -50.4 | -77.6 | -32.1 |
| IF 10.2 kHz ENBW | -85.2 | -63.7 | -79.3 | -44.3 |
| IF 7.8 kHz ENBW | -86.4 | -70.2 | -81.3 | -56.4 |
| IF 5.7 kHz ENBW | -87.7 | -72.7 | -83.3 | -65.7 |

Table C-7. Intercepted Power from DVP Emitter

| | Intercepted Power from DVP | | | |
|------------------|----------------------------|--------|--------|----------|
| | VHF | | UHF | |
| IF Configuration | 30 kHz | 15 kHz | 25 kHz | 12.5 kHz |
| IF 12.6 kHz ENBW | -83.0 | -27.7 | -61.4 | -15.7 |
| IF 10.2 kHz ENBW | -91.2 | -30.7 | -65.7 | -24.3 |
| IF 7.8 kHz ENBW | -93.2 | -34.0 | -71.0 | -28.6 |
| IF 5.7 kHz ENBW | -94.5 | -37.8 | -77.0 | -30.1 |

Table C-8. Intercepted Power from EDACS® 12.5 kHz Emitter

| | Intercepted Power from EDACS® 12.5 kHz | | | |
|------------------|--|--------|--------|----------|
| | VHF | | UHF | |
| IF Configuration | 30 kHz | 15 kHz | 25 kHz | 12.5 kHz |
| IF 12.6 kHz ENBW | -91.3 | -38.4 | -78.5 | -26.8 |
| IF 10.2 kHz ENBW | -94.6 | -43.7 | -81.4 | -35.5 |
| IF 7.8 kHz ENBW | -95.9 | -51.9 | -84.3 | -38.7 |
| IF 5.7 kHz ENBW | -97.2 | -60.1 | -87.6 | -43.1 |

Table C-9. Intercepted Power from EDACS® 25 kHz Emitter

| | Intercepted Power from EDACS® 25 kHz | | | |
|------------------|--------------------------------------|--------|--------|----------|
| | VHF | | UHF | |
| IF Configuration | 30 kHz | 15 kHz | 25 kHz | 12.5 kHz |
| IF 12.6 kHz ENBW | -80.3 | -28.3 | -53.1 | -20.7 |
| IF 10.2 kHz ENBW | -90.9 | -32.3 | -57.9 | -26.1 |
| IF 7.8 kHz ENBW | -93.3 | -37.9 | -65.5 | -28.4 |
| IF 5.7 kHz ENBW | -94.6 | -42.7 | -75.7 | -31.7 |

Table C-10. Recommendations for ACCP (dB) from Adjacent Offset Channels

| Emitter Modulation to Receiver Configuration (T to R) | 7.5 kHz | 6.25 kHz |
|---|---------|----------|
| 25 kHz Wide band FM to 12.5 kHz Narrow IF Rcvr | 10 | na |
| 25 kHz Wide band FM to 6.25 kHz Narrow IF Rcvr | TBD | ? TBD |
| 12.5 kHz Narrow FM to 25 kHz Wide FM IF Rcvr | 6 | na |
| 12.5 kHz Narrow Digital to 25 kHz Wide FM IF Rcvr | 6 | na |
| 12.5 kHz Narrow FM to 12.5 kHz Narrow IF Rcvr | 27 | 17 |
| 12.5 kHz Narrow Digital to 12.5 kHz Narrow IF Rcvr | 26.5 | 18 |
| 6.25 kHz Narrow Digital to 25 kHz Wide FM IF Rcvr | TBD | TBD |
| 6.25 kHz Narrow Digital to 12.5 kHz Narrow IF Rcvr | TBD | TBD |

**Appendix-D. Methodology for Determining Service
Area for Existing Land Mobile Licensees Between 30 and
512 MHz**

Appendix-D. Methodology for Determining Service Area for Existing Land Mobile Licensees Between 30 and 512 MHz

We also have been asked by the Land Mobile Communications Council to address how the service area of an existing licensee should be determined. Such a task is not trivial as many of the data points present for new applications are not readily available for existing licensees.

The following contains an approach and methodology which, when used in conjunction with the overall WG 8.8 modeling and simulation methodology advanced in the body of this document, will permit the determination of a service area for most scenarios.

D.1 Information

It is possible to generalize a service area if certain basic elements are known or derived from the existing license which include:

- File or Reference Number
- Licensee Name
- Licensee Address (Mailing)
- Licensee Address (Physical)
- Latitude and Longitude Coordinates
- Ground Elevation AMSL
- Antenna Height AGL
- Fixed Station Class
- Mobile Station Class
- Fixed Station Transmitter Power Output
- Fixed Station Transmitter ERP (ref. half wave dipole). If ERP is not known, ERP will be inferred as follows:

| <u>Frequency Band</u> | <u>Inferred Fixed Station ERP</u> |
|------------------------------|--|
| 30-50 MHz | 0.7x Transmitter Output Power |
| 136-174 MHz | 2.0x Transmitter Output Power |
| 406-512 MHz | 4.0x Transmitter Output Power |

- Radio Service using current nomenclature, i.e., Police, Land Transportation, etc.

D.2 General Assumptions and Predicates

The WG 8.8 Modeling and Simulation Methodology will be employed as modified by the assumptions and predicates presented in this appendix.

D.2.1 Units and measures are consistently applied.

D.2.2 The modulation employed is analog frequency modulation with an emission designator of 16K0F3E .

D.2.3 The fixed station and mobile receiver performance meets TIA 603 concerning adjacent channel performance.

D.2.4 The fixed station and mobile transmitter sideband spectrum is represented by Tables C-1 and C-2.

D.2.5 Typical configurations of transmitter spectrum (ACCP) intercepted by various receiver configurations are tabulated in Tables C-3 through C-9.

D.2.6 Omni-directional fixed station antenna is used.

D.2.7 The mobile units operating with the associated base station/mobile relay operate within the coverage area of the base station/mobile relay.

D.2.8 Where handheld/portable units are licensed portable/handheld usage is assumed primary and the appropriate handheld/portable antenna correction factor shall be applied.

D.2.9 Handheld/portable antenna correction factor shall be applied as follows:

| <u>Frequency Band</u> | <u>Handheld/Portable Antenna Correction Factor</u> |
|------------------------------|---|
| 30-50 MHz | -15 dB |
| 136-174 MHz | -10 dB |
| 406-512 MHz | -6 dB |

Note: Reference half wave dipole.

D.2.10 Coverage reliability is assumed as a function of radio service. The values are as follows:

| <u>Radio Service</u> | <u>Area Coverage Reliability</u> |
|-----------------------------|---|
| Public Safety | 97% |
| LMR | 90% |

D.2.11 Average levels of ambient RF noise, referred to as kT_0b , are assumed. For 132-174 MHz this equates to a 6 dB derating value and a 3 dB derating value for 406-512 MHz. The RF noise level is defined in Section 4.2.

D.2.12 CPC is assumed as a function of radio service. The values are as follows:

| <u>Radio Service</u> | <u>CPC for Analog FM</u> |
|-----------------------------|---------------------------------|
| Public Safety | DAQ-3.4 Equivalent |
| LMR | DAQ-2 Equivalent |

Note: DAQ-3.4 is defined as 20 dB SINAD equivalent intelligibility.
DAQ-2 is defined as 12 dB SINAD equivalent intelligibility.

D.3 Discussion

This methodology assumes *a priori* that the information contained on the license is accurate and that the licensee is currently operating the station within the licensed parameters. However, when the parameters are evaluated in context of the overall modeling and simulation methodology proposed, a coverage area in the form of an irregular polygon may be determined for any existing licensed station.

In the event an existing licensee desired additional consideration above and beyond that provided by the above predicates, such a licensee could provide all of the information required of a new applicant. With more complete information a more finely tuned service area may be determined.

Appendix-E. User Choices

Appendix-E. User Choices

The main body of this document does not present a “hard and fast” methodology. It presents the user with a number of choices which must be made to perform the system design, spectrum management, and performance confirmation functions. The purpose of this Appendix is to present those choices in a simplified format so that users can clearly identify to others (e.g., prospective bidders) the specifics of the desired method.

Each choice is shown as a brief description along with a reference to the section of the main body where the choices are fully described. In those sections where optional choices can be made, no choice allows either selection to be used.

E.1 Identify Service Area - § 3.1 Use any of the methods of service area definition shown in Appendix B (between Tables B-2 and B-3).

E.2 Identify Channel Performance Criterion - §§ 3.2 & 3.5.1 For DAQ definitions, see Appendix-A, Table 1.

DAQ: _____

E.3 Identify Reliability Design Targets (both percentage and whether CPC contour or service area) - §§ 3.4 - 3.4.2 For advice, see § D.2.10.

_____ % ☐ CPC Contour (select one)
 ☐ Service Area

E.4 Identify the acceptable terrain profile extraction methods (check one or both) - §§ 5.3.1

- ☐ Bilinear Interpolation Method
- ☐ Snap to Grid Method

E.5 Identify acceptable interference calculation methods (check one or both) - §§ 5.9

- ☐ Equivalent Interferer Method
- ☐ Monte Carlo Simulation Method

E.6 Identify which metaphor(s) may be used to describe the plane of the service area -
Select from those described in §§ 5.7.1, 5.7.2, 5.7.3, and 5.7.4. See §§5.7 - 5.7.6 for discussion.

Select those that are acceptable (only the last two are acceptable for interference calculation or simulcast design):

- ☐ Radial Method
- ☐ Stepped Radial Method
- ☐ Grid Mapped from Radial Method
- ☐ Tiled Method

E.7 Determine required service area reliability to be predicted - §§ 3.6.2.2 and 5.8.

_____ %

E.8 Determine Conformance Test confidence level - §§ 6.2.1, 6.4.1, and 6.5.4. This value is typically 99%.

_____ %

E.9 Determine Sampling Error Allowance - §§ 6.2.1 & 6.4.2

± _____ %

E.10 Determine which Pass/Fail Criterion to use - §§ 6.3 - 6.3.2

Select one:

- ☐ "Greater than" test
- ☐ Acceptance window test

E.11 Treatment of Inaccessible Grids - § 6.4.4

Select one:

- ☐ All are eliminated from the calculation
- ☐ All are considered a "pass"

- ☐ Single isolated inaccessible grids are estimated based upon “majority vote” of adjacent grids; multiple adjacent inaccessible grids are eliminated from the calculation
- ☐ Single isolated inaccessible grids are estimated based upon “majority vote” of adjacent grids; multiple adjacent inaccessible grids are considered a “pass”.

E.12 Adjacent channel drift confidence - § C.6.4.2

Confidence that combined drift due to desired and adjacent-channel stations will not cause degradation:

_____ %